

## THE WANDERERS: Planets of our Solar System

Human Beings have been studying the night sky for thousands of years. Without electricity and television, the broad night sky was the fun thing to watch. Our ancient ancestors could see the sky much better back then, too. They didn't have the electric lights of millions of cities and towns dimming the stars, or tall buildings blocking their immediate view. Whenever they were outside of a shelter at night, they witnessed an extremely vast twinkling sky illuminated with millions of celestial objects. The night sky was a big attraction!

Today, there is so much ambient light from all the cities and towns that there are some places you can't see the stars at all. Buildings also block out the sky for city and town dwellers. Many people have stopped bothering to look up at the sky at night...because they simply can't see it.

The ancients watched and studied the sky in awe. Even without telescopes or any scientific knowledge, they studied it, made charts and drawings, and kept track of the celestial objects they saw. They saw star patterns that we now call constellations (one of the most famous is the Big Dipper), and they saw planets...even though they didn't understand them at first.

Ancient people became very good at learning about the night sky and were the first astronomers—scientists who study outer space. What really caught their eye were objects that were brighter than others and didn't remain in one place. They watched these objects as they moved across the sky and showed up in different places. The Greek astronomers called these objects "planetes" (which means "wanderers" in Greek) because of the way they seemed to "wander" about the sky. Today, we call them "planets," which comes from the Greek word "planetes."

The astronomers of ancient days were able to figure many things out without any of the technology we have. They weren't always correct, but they were close. At first, one Greek astronomer named Ptolemy declared that the Earth was the center of the universe and the other objects, including the sun, revolved around Earth. He was wrong about this, but he was right when he described how objects moved in an orbit—a path that revolves, in a circle, around another object.

For 1,400 years, Ptolemy's theory about the Earth was believed to be true. Then, another astronomer named Copernicus tried to convince the world that the sun was at the center of our universe and that the planets, including Earth, revolved around *it*. His theory was not accepted for a long time. The telescope had to be invented, Galileo had to use it and agree with Copernicus's theory, Isaac Newton had to explain gravity, and many years had to pass before it was determined that the sun was indeed the center of our solar system and that the planets revolved around the sun.

## THE WANDERERS: Planets of our Solar System (Cont'd)

Everyday new discoveries are made. Technology advances our old theories and we must grow and be open to change. For instance, from 1930 until 2006, we thought (and taught our children) that nine planets made up our solar system. Now scientists say there are only eight! Who are the eight “wanderers”...and what happened to # 9?

The eight planets of today are listed in order from the closest to the sun to the farthest away. The first four planets, Mercury, Venus, Earth, and Mars are considered “terrestrial” planets. They are made up of mostly solid material. The farther planets, Jupiter, Saturn, Uranus, and Neptune are made up mostly of gases. Scientists believe this is because the sun’s heat evaporated the gases of the closer planets leaving them solid spheres. The further planets have retained some rock and dirt within the thick layers of gas, but are considered the solar system’s gas giants. All revolve around the sun at different speeds and even revolve on their axis at different speeds.

In reading about the planets, keep in mind that *ROTATION* means one complete spin on the planet’s axis. On Earth, this is considered one day, or 24 hours. *ORBIT* means one complete circle around the sun. On Earth, this is considered one year, or 365 days.

**Mercury:** The smallest of planets and closest to the sun. Mercury has no atmosphere (layer of air) and while the days are extremely hot, the lack of atmosphere lets the heat disperse quickly and causes the nights to be extremely cold. One day on Mercury is equal to 59 days on Earth! So the days last a long time, but Mercury only takes 88 days to orbit the sun, making a year last only 88 days to our 365.

**Venus:** The second planet from the sun, Venus is the brightest object in our sky (after the sun and moon). It has a cloud cover made up of a mixture of gases that reflect the sun’s light. This is why Venus looks so bright. Just a bit smaller than Earth, Venus rotates very slowly. One day on Venus is longer than a whole year on Earth! It takes 243 Earth days for one day to complete on Venus. A year (the time it takes for Venus to orbit the sun) is only 225 days. This means that a day lasts longer than a year for this planet! Venus rotates in the opposite direction of all other planets, too, making it unique.

**Earth:** The third planet from the sun, Earth has the perfect environment for plant, animal, and human life, as we know it. Earth’s gravity holds its atmosphere around it. Earth has one moon and so much water on the surface that it often looks blue from outer space.

## THE WANDERERS: Planets of our Solar System (Cont'd)

**Mars**: The fourth planet, Mars is just a little bigger than half of the earth. It has a thin atmosphere and appears red in space. Scientists think that the atmosphere has rusted the iron surface on Mars and that is why it looks red. A day is about the same as on Earth, but it takes two Earth years to complete one year on Mars. NASA's Rover mission sent 2 robotic spacecrafts to explore the surface of Mars. They found evidence that Mars once had water although it is dry now. Mars is home to the largest canyon yet found in our solar system. It is 7 times longer than our Grand Canyon!

**Jupiter**: The largest planet of all, and the first "gas giant" in the order. Jupiter has at least 62 moons. One moon, named Ganymede, is the largest moon we know of in our solar system. Io, another of Jupiter's moons, has volcanoes that still erupt. NASA's "New Horizon" mission, launched in January of 2006, flew by Jupiter in February 2007 and took pictures of Tvashtar, a volcano on Io, sending plumes of material 200 miles into the sky. It also took images of the moon Europa that showed there might be water under its frozen crust. Jupiter is known for its giant red spot that scientists believe is a concentrated area of gases. It has a few very thin rings, and a day is only 10 of our hours long. But it takes 12 Earth years to make one year on Jupiter.

**Saturn**: The sixth planet from the sun has a unique feature. Saturn has thousands of rings around it that look like one big ring at fist. The rings are pieces of ice and rock that constantly "ring" this second largest planet. So far, astronomers have counted sixty moons around Saturn. The largest moon, called Titan, is the only moon we know of so far that has a dense atmosphere. NASA's New Horizon probe found evidence of water and organics in this atmosphere! One year on Saturn is about 30 Earth years long, but a day on Saturn is only about 11 hours long.

**Uranus**: This seventh planet from the sun has eleven rings around it and is very far from the sun—about one and a half billion miles away! After Voyager II left Earth in 1977, it didn't pass Uranus for nine years! So far, 27 moons have been recorded for Uranus. Although a day on Uranus takes only about 17 hours, it takes almost 84 years to make a trip around the sun.

**Neptune**: The eighth planet from the sun, Neptune has a gas in its atmosphere that makes it appear blue from space. It took 3 more years for Voyager II to get to Neptune from Uranus. They are almost the same size, but Neptune rotates a bit faster with one day taking about 16 Earth hours. A trip around the sun takes Neptune about 165 of our years. Scientists have counted 13 moons around Neptune.

## THE WANDERERS: Planets of our Solar System (Cont'd)

Now we have covered the eight spheres in space considered *planets* today. Up until 2006, a ninth sphere, Pluto, was also considered a *planet*. In 2006, the International Astronomical Union, formed in 1919 and made up of astronomers from many different countries, decided to define what, exactly, made a *planet*. They decided that a planet must:

1. Orbit the Sun.
2. Be round (or almost round) due to gravitational pull.
3. Be big enough with enough gravity to “clear the neighborhood” and have no other space objects (comets, asteroids, space debris) in its orbit except for its own moons.

A new term, ***dwarf planets***, was given to objects such as Pluto, its moon Charon, a small object thought to be another planet but then changed to asteroid, called Ceres, and a new, very distant object far past Pluto that astronomers now call Eris. These objects are orbiting out in far space with other objects in their orbits. This area is called the Kuiper Belt after Gerard Kuiper, a Dutch-American astronomer who predicted that such an area of thousands of icy space objects existed. Some of these fit the requirements to be called ***dwarf planets***. They must:

1. Orbit the Sun
2. Be round
3. Not be a moon or satellite of another planet

**Pluto** is now considered part of the Kuiper Belt objects and has been demoted to dwarf planet. Pluto’s orbit is oblong and tilted. In fact, there are times that Pluto’s orbit crosses into Neptune’s orbit. For about 20 years of its 248 Earth year orbit, Pluto is actually closer to the sun than Neptune! This happened in 1979 and lasted until 1999. Pluto should also be a gaseous planet like Jupiter, Saturn, Uranus, and Neptune—but astronomers studied light reflected off Pluto and a dense, rocky core is detected. NASA’s “New Horizon” spacecraft is expected to pass by Pluto in 2015 and scientists hope to get more information about this.

Name \_\_\_\_\_

Date \_\_\_\_\_

## THE WANDERERS: Planets of our Solar System Questions

### Section I: Choose the right word to fill in the Blank

1. \_\_\_\_\_, a Greek astronomer, thought that the Earth was the center of the universe.
2. Years later, \_\_\_\_\_ tried to convince the world that the sun was the center of our solar system.
3. From 1930 until \_\_\_\_\_, we counted \_\_\_\_\_ as the ninth planet.
4. A \_\_\_\_\_ is one complete spin of a planet on its axis, counted as a day.
5. When planets travel around the sun in a circular path, it is said they are \_\_\_\_\_ the sun.
6. The smallest planet in our solar system is \_\_\_\_\_.
7. The four closest planets to the sun are considered \_\_\_\_\_.
8. The planet \_\_\_\_\_ may have had water on it at one time.
9. \_\_\_\_\_ rotates in the opposite direction of all the other planets.
10. A year is not \_\_\_\_\_ days long for all the planets.

### List of choices:

Orbiting  
Pluto  
2006  
Copernicus  
365  
Rotation

Ptolemy  
Terrestrial  
Venus  
1996  
Galileo  
Stalking

284  
Mars  
Apollo  
Mercury  
Sun gods  
Eris

Name \_\_\_\_\_

Date \_\_\_\_\_

## THE WANDERERS: Planets of our Solar System Questions (Cont'd)

### Section II: True or False?

1. Modern day electric lights have nothing to do with the night sky.  
\_\_\_\_\_
2. People today enjoy the night sky more than the ancient people did.  
\_\_\_\_\_
3. A day on the Earth is as long as a day on any other planet.  
\_\_\_\_\_
4. A planet can have objects other than its own moons sharing its orbit.  
\_\_\_\_\_
5. There are eight planets we know of today.  
\_\_\_\_\_
6. NASA has a spacecraft heading to Pluto.  
\_\_\_\_\_
7. Gravity causes the planets to be round.  
\_\_\_\_\_
8. Saturn has thousands of pieces of icy rocks circling it in rings.  
\_\_\_\_\_
9. Jupiter has a moon that has volcanic eruptions going on.  
\_\_\_\_\_
10. The Kuiper Belt is an ancient constellation in the sky.  
\_\_\_\_\_

### Bonus Question:

For twenty years, between 1979 and 1999, Pluto, once considered the furthest planet from the sun, was closer to the sun than the planet Neptune. Why / how did this happen?

Name \_\_\_\_\_

Date \_\_\_\_\_

## THE WANDERERS: Planets of our Solar System Answers

### **Section I**

1. Ptolemy
2. Copernicus
3. 2006
4. rotation
5. orbiting
6. Mercury
7. terrestrial
8. Mars
9. Venus
10. 365

### **Section II**

1. F
2. F
3. F
4. F
5. T
6. T
7. T
8. T
9. T
10. F

### **Bonus Question**

Pluto's orbit is irregularly tilted and is more oblong than oval. This combination causes it to cross over Neptune's orbit once each time it circles the sun (one Pluto year). A year for Pluto is 248 Earth years long. Only once in 248 Earth years does this happen. It occurred in 1979 and remained closer to the sun than Neptune for 20 Earth years (until 1999).